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An adaptative design for the SiW-ECAL of e+e- colliders

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To exploit at best the physics potential of future e+e–colliders, the particle flow approach combining optimally the information from a precision tracking and an imaging calorimetric systems was adopted by most detector concepts (ILD and SiD for the ILC, CLICdp for the CLIC, CLD for the FCC-ee and the "Baseline detector"for CEPC).
One of the most advanced solutions for an imaging electromagnetic calorimeter (ECAL) suitable for any of these experiments involves Silicon as sensor material interleaved with Tungsten as a radiator in carbon fibre structures, combining flexibility, intrinsic stability and compactness. Its most complete description has been done for ILD SiW-ECAL. The scalable design integrates the testability of every component, an indispensable trait, given the massive number of elements involved.
The base element of the detector, so-called ASU for Assembly Single Unit, is a stitchable electronic board holding, on one side, the readout electronics and, on the other, the Silicon PIN diode matrices. The first bunch of 7 ASUs was successfully tested as a stack in beam tests (DESY-2018, CERN-2018 and DESY-2019), and its performances have been reported at this conference. This work focuses on their implementation in a long slab, as needed for the experiments, holding between 6 and 12 ASUs, depending on the detector geometry.
A model of an "electric"slab, relieved of mechanical constraints w.r.t. the final design, was built with 8 ASUs to investigate CEM, readout and power issues. It was tested in-beam in 2018 and in-lab since. After modifications, the signal-to-noise ratio for mips was found to be appropriate but depending on the position, pointing to the need for power distributions improvements. The results and issues will be discussed here together with possible implications for the high-luminosity schemes.

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